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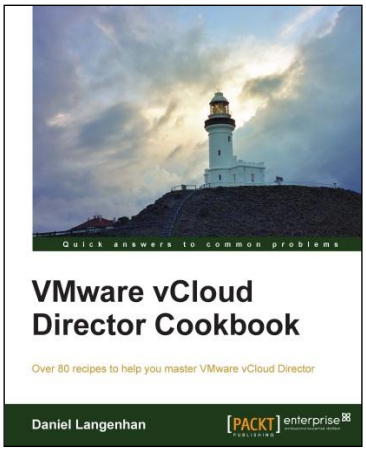
VMware vCloud Director Cookbook

Daniel Langenhan



Chapter No. 5
"Working with the vCloud API"

In this package, you will find:

A Biography of the author of the book

A preview chapter from the book, Chapter NO.5 "Working with the vCloud API"

A synopsis of the book's content

Information on where to buy this book

About the Author

Daniel Langenhan is a client-focused Virtualization Expert with more than 18 years of international industry experience.

His skills span the breadth of virtualization, ranging from architecture, design, and implementation for large multitier enterprise client systems to delivering captivating education and training sessions in security technologies and practices to diverse audiences.

In addition to this, he possesses an extensive knowledge and experience in process management, enterprise-level storage, Linux, and Solaris operating systems.

Utilizing his extensive knowledge, experience, and skills, he has a proven track record of successful integration of virtualization into different business areas, while minimizing cost and maximizing reliability and effectiveness of the solutions for his clients.

He has gained his experience with major Australian and international vendors and clients. Daniel's consulting company is well established with strong industry ties in many verticals, for example, finance, telecommunications, and print. His consulting business also provided services to VMware International.

Daniel is the author of *Instant VMware vCloud Starter, Packt Publishing* and *VMware View Security Essentials, Packt Publishing*.

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I would like to thank my wife, Renata, for her tireless support and patience in all things. This book would not have been possible without her.

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VMware vCloud Director Cookbook

VMware vCloud has evolved to be one of the most exciting technologies in the last few years. It is not only the follow-up product to VMware Lab Manager but it also opens up your vSphere infrastructure for customer-based management. VMware vCloud allows you to manage your vSphere infrastructure and lets you push work from the administrators back onto the customers. This enables customers to self provide and self administer their resources without impacting their security or resource management.

This book contains the most up-to-date and enterprise-proven concepts to enhance your vCloud productivity. Not only do we discuss vCloud 5.1, but we also talk about the newest release, vCloud 5.5. You will see how to integrate these new features and increase your productivity even more.

We will present recipes that not only deal with the daily tasks but also present you with new ideas and concepts that you may not have thought of before, as well as give you some great tips and shortcuts.

What This Book Covers

Chapter 1, *Setting Up Networks*, walks you through the creation of the different networks that exist in vCloud. We will go from External Networks, through VXLANs, and the Cisco 1000v to Edge networks.

Chapter 2, *vCloud Networks*, plays with all the vCloud networking, routing, and isolation possibilities. Accessing isolated network, working with vCloud routers, as well as Edge and fencing will be investigated.

Chapter 3, *Better vApps*, delves into all that you can do with vApps. We will discuss the import and export of vApps as well as Guest Customization.

Chapter 4, *Datastores and Storage Profiles*, focuses on Datastores, storage profiles, and linked clones.

Chapter 5, *Working with the vCloud API*, introduces you to working with the vCloud API. We will be using PowerShell, PHP, vCenter Orchestrator as well as the REST API to build VMs.

Chapter 6, *Improving the vCloud Design*, will give you a new understanding of how to design a productive and effective vCloud environment.

Chapter 7, *Operational Challenges*, introduces you to solutions to combat common and uncommon operational problems. This chapter is a collection of all kinds of useful recipes that will provide you with tips and tricks on how to be more efficient with vCloud Director.

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Chapter 8, *Troubleshooting vCloud*, focuses on logfiles, error finding, and recovery.

Appendix, contains a list of all the abbreviations used used in this book.

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Working with the vCloud API

In this chapter, we will cover topics that will introduce us to accessing the vCloud API using the most common languages. We will look at the following recipes:

- Using PowerShell with vCloud Director
- Accessing REST with Firefox
- Accessing vCD via PHP
- Using vCenter Orchestrator to automate vCloud
- A scripted cell shutdown
- Adding ISO files to vCD automatically

Introduction

The API interface of vCloud is an HTTPS-based REST interface. This is a major improvement over the vSphere API, which is SOAP-based. Most of the newer developments of VMware now come with a REST-based interface, adopting and standardizing on modern standards. The main difference between SOAP and REST is that REST can be accessed very easily and without much overhead, while SOAP advertises to clients how it needs to be addressed and what return is to be expected.

Saying that, vCloud uses REST to talk to vCNS, and SOAP to talk to the vSphere API.

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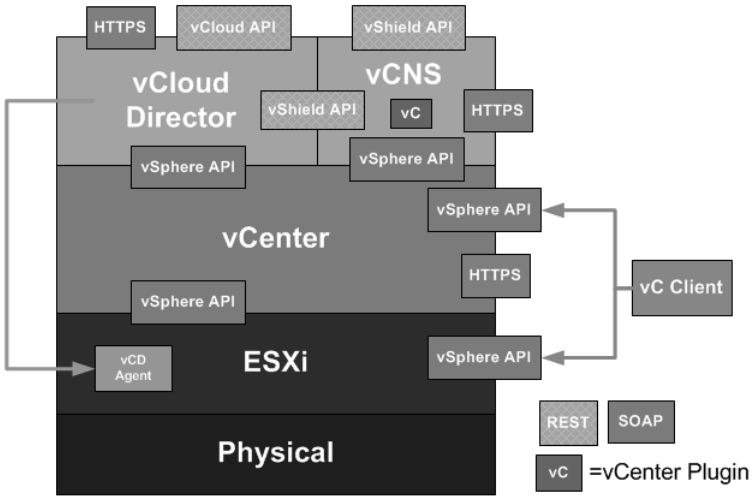
The next diagram shows all the connections of the full vCloud Suite. It shows all the API interactions between the various vSphere, vCloud, and vCNS components.



The focus of this chapter is to get you started with the different ways to access the vCloud API. It is not intended to teach you the full set of possibilities of each language or tool, but to make your first steps easier. At the end of each recipe, I will give you links that will help you get to the next level.

One thing you really need to understand is that the vCloud web interface (the GUI) you have used until now is not using the API. This means that you can't always follow the same way in programming as you do clicking though the GUI.

You can use almost any language to automate vCloud, but there are a few ready-made solutions that make your life easier. Such ready-made solutions are provided for Microsoft PowerShell, PHP, Perl, vCenter Orchestrator, and for using direct REST calls.

For each of these methods, we will investigate:

- What we need and where to get it from
- Some install and config tips
- How to connect to vCloud
- How to get base information out of vCloud

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- How to deploy a new vApp from a vApp template
- How to start a vApp

Logging in to the System organization

When you log in to vCloud using the vCloud API, you can log in to the `System` organization or a different organization. When you log in to vCloud, you must choose the organization in which you want to log in to by adding the organization to your username. For example, `MyUser@System` would log me in to the `System` organization (mind the capital S) and `MyUser@MyOrg` would log me in to the organization `MyOrg`.

The `System` organization is the highest level in vCloud and you have to be `SysAdmin` to successfully log in to it. In the `System` organization, you can do everything that you can do in vCloud and across all other organizations.

When logged in to another organization, you can only do things your role allows you.

One thing I would always do is create a user for any automation tool that accesses vCloud. This makes sure that you can easily track what the automation does in the logs, as well as shut down the access to the vCloud very fast. This is especially true when logged in to the `System` organization.

To successfully follow the recipes in this chapter, you need to have access to the `System` organization.

Gathering prerequisites and information gathering

For all our recipes we need:

- A dedicated user for the API who is `SysAdmin` in vCloud
- An organization and OvDC with an Organization Network that we can use
- A vApp template that we can use for deployment

In each recipe, we will have four main themes: connecting to vCloud, gathering information, creating a vApp, and powering the new vApp on.

In the section where we gather information, we will collect the information that we need in order to deploy a new vApp. To create a new vApp, we need the following information:

- The OvDC that the vApp will be deployed to
- The vApp template we want to deploy from
- The network we want to connect the new vApp to

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Please note that square brackets [ ] will be used to indicate that you need to enter something into the code at this stage.

So if I write `get-Org –name [Name of Org]`, you should be writing something like `get-org –name MyOrg`.

Project Onyx

I would also keep a lookout on the Onyx project. Onyx creates automation code based on mouse clicks; however, it currently works only with vSphere Client (not the Web Client) and not with vCloud. But you should keep tabs on it. More on Onyx can be found at:

`http://communities.vmware.com/community/vmtn/automatiotools/onyx`

Using PowerShell with vCloud Director

This is how you can access vCloud using Microsoft PowerShell.

Getting ready

Please note that the vApp template we will be using should not have a network attached.

Installing PowerCLI

You need to install vSphere PowerCLI; you can download it from `www.vmware.com/go/powercli`.

When you install PowerCLI, make sure that you install it with the vCloud Director PowerCLI option, which is not installed by default. You can always reinstall PowerCLI with the correct settings. If you already have PowerCLI installed, you can re-run the installer to add the vCloud PowerCLI.

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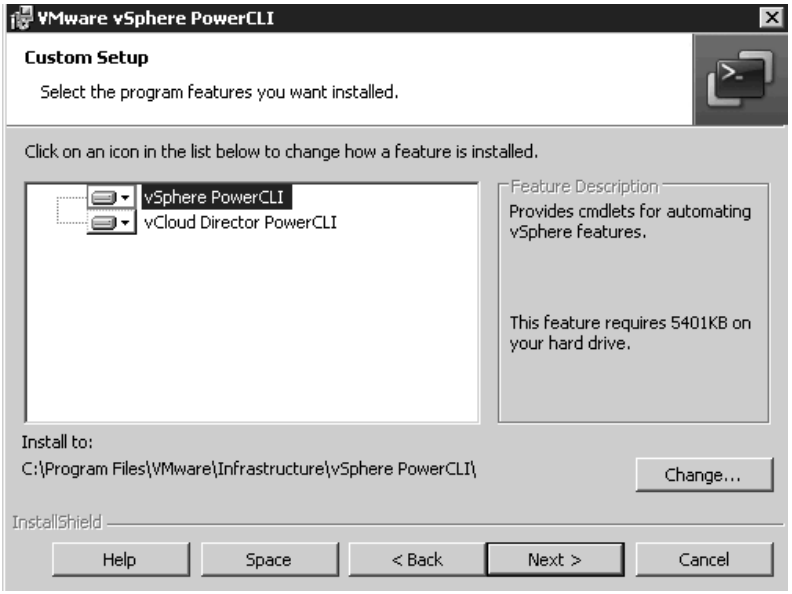

After you have installed PowerCLI, you have to run the following command in PowerShell to make it work:

```
Set-executionPolicy remotesigned
```

A PowerShell editor

A really good program to use with PowerShell is the free software PowerGUI. It helps with exploring the API and its objects. You can download it from `www.powergui.org`.

After you have installed PowerGUI, you need to activate the VMware libraries by performing the following steps:

1. Open the PowerGui script editor.
2. Navigate to **File** | **PowerShell Library**.
3. Select all VMware libraries.
4. Click on **OK**.

When you now type in the script editor pressing *Tab*, it will show all the available commands.

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How to do it...

We now go through all the steps, from connecting to powering on the vApp.

Connecting vApp

1. Open PowerShell or PowerGUI Script Editor.
2. Run the following command:

   ```
   Connect-CIServer [ip or name of vCD]
   ```

   CI stands for Cloud Infrastructure; most vCloud comments begin with CI

3. You will now be asked for your credentials. Enter the user you created for accessing the API.
4. Now run the following command:

   ```
   get-Org
   ```

   This command should show you all the organizations you have currently in your vCloud and verifies that everything is working as it should

Gathering information

Now that we are logged in, let's get the information we need to deploy a vApp.

1. We will store everything in variables, so we can use it again later. Now let's get the OvDC we want. Run the following command:

   ```
   Get-OrgVdc
   ```

   It will display all the OvDCs that you currently have

2. We now select one and store it in a variable. If you like, you can just copy and paste the name of the organization in the following command:

   ```
   $OvDC = Get-OrgVdc –Name [name of the Org]
   ```

   If you are using PowerGUI, you will see that the variable `$OvDC` has been added to the right side. You can now use your mouse to expand the content, showing all attributes and child elements of the OvDC you stored in the variable

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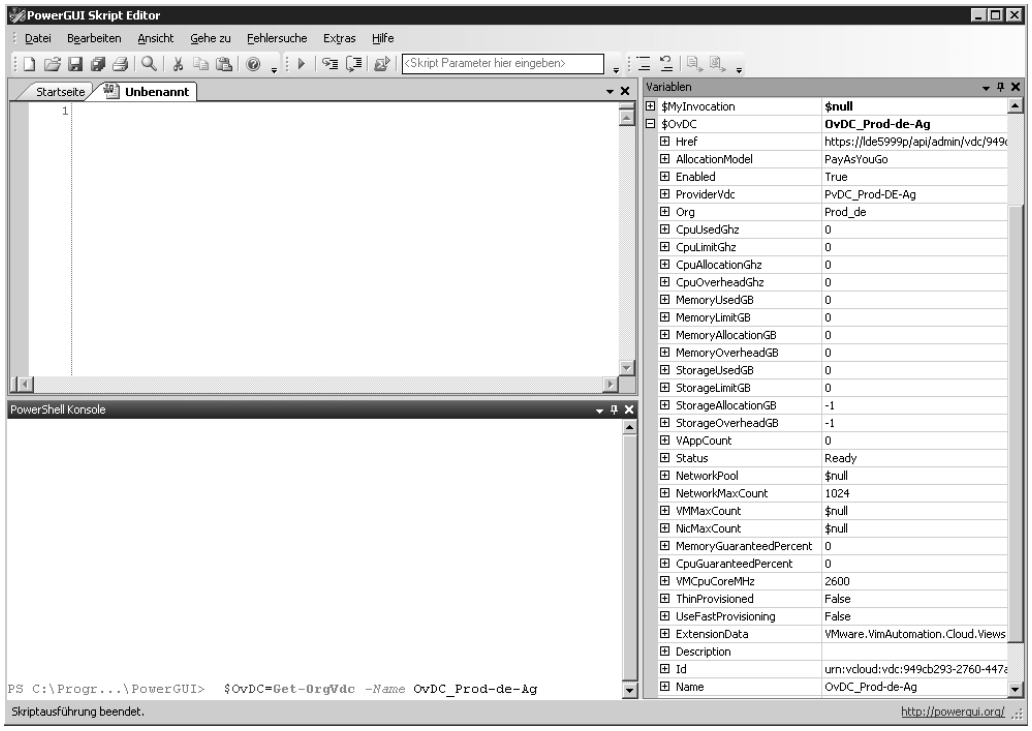

3. Let's get the Organization Network by using a pipe. The pipe we will be using is the | symbol and it means that the result from the last command will be forwarded into the next command as shown in the following command:

```
Get-org -Name [Org name] | Get-OrgNetwork
```

The next command shows only the Organization Networks that exists in the organization you specified:

```
$Onet = Get-org -Name [Org name]|Get-OrgNetwork -Name [OrgNet name]
```

4. We now get the vApp template. This time we will use a filter; however, you can still use the direct method using the name of the template. The `where` filter is quite good for that; playaround or look up the difference between `-like` and `-contains`. The `$_` variable is very important in Powershell as it stores the values of the last used output. In the next example, we basically loop through all vApp templates and look if any of them (`$_`) have name attributes that are similar to the vApp template names.

```
$Tvapp=Get-CIVAppTemplate |where {$_.name -like "[template name]"}
```

We have now collected all the information we need, so let's deploy a new vApp.

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Creating vApp

1. To create a new vApp, run the following command:

   ```
   $vApp =New-CIVApp -Name MyTest -VAppTemplate $Tvapp -OrgVdc $OvDC
   ```

   As you see, we have captured the new vApp directly in a variable to be reused later.

2. After the vApp is deployed, we now need to add a network to it. It can be done by running the following command:

   ```
   $vappNet=New-CIVAppNetwork -ParentOrgNetwork $Onet -VApp $vapp –
   Direct
   ```

3. The vApp now has a network, but we still need to attach the VM in the vApp to the network. That is easily done by running the following command:

   ```
   $vapp|Get-CIVM|Get-CINetworkAdapter|Set-CINetworkAdapter
   -VAppNetwork $vappnet -Connected $true -IPAddressAllocationMode
   Pool
   ```

   Have a look at the command. It is rather fancy. We take the vApp, get its VMs, get the VMs' network card information, and then set the same card with the new settings. This works not only for one VM inside a vApp but for all VMs and all their network cards. The pipe | here acts like the `for each` command.

You now have created a vApp and connected it to a network.

Powering on vApp

- The last step of powering on the vApp is very simple. It can be done by running the following command:

  ```
  $vapp|Start-CIVApp
  ```

How it works...

PowerShell connects to the REST API of vCloud. This means that even if a command currently doesn't exist or doesn't do all that you expected it to do, you can always build the command by using variables. The VMware community is a big help and PowerCLI is improving fast for vCloud use.

Not all options are exposed to PowerCLI at the moment; however, if you use the command `GET-CIVIEW`, you will get all the arguments. As an example, have a look at the difference between the content of the two objects:

```
$temp  = get-org –name [name of an org]
$temp2 = get-org –name [name of an org] | get-ciview
```


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See also

- There is quite some help online in the VMware community at `http://communities.vmware.com/community/vmtn/automationtools/powercli/vcdpowercli`
- You can see all the PowerShell commands at `http://www.vmware.com/support/developer/PowerCLI/PowerCLI51/html/` or by navigating to **Windows on Start** | **VMware** | **PowerCLI**; there you find a help file as well as other documents

Accessing REST with Firefox

We will now access vCloud using REST directly as explained in the following sections.

Getting ready

Please note that the vApp template we will be using should have a network attached.

We first need to download and install a REST client we can play with. I prefer the Firefox plugin, which you can download from `https://addons.mozilla.org/en-US/firefox/addon/restclient/`.

After downloading and installing the client, we are ready to go.

How to do it...

We will now use the REST API to work with vCloud.

The first connection

1. Open Firefox and go to the Add On **RESTClient**.
2. Click on **Authentication** and select **Basic Authentication**.
3. Enter your vCloud username and password. The username should be in the format `myuser@System`, to make sure you authenticate to the `System` organization of vCloud. You may also want to check the **Remember me** box.
4. Click on **Headers** and select **Custom Header**.

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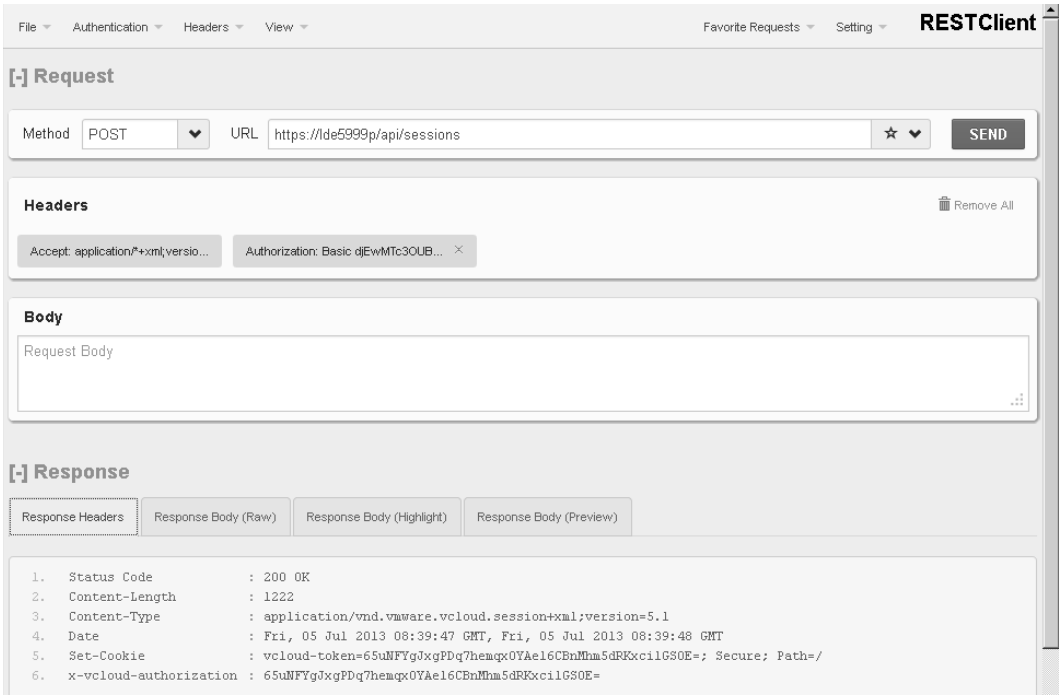
5. Enter `Accept` under **Name** and `application/*+xml;version=5.1` under Value. Check **Save to favorite** as we need this constantly and then click on **Okay**.

6. Set **Method** to **POST** and **URL** to `https://[vcloud ip or hostname]/api/sessions`.
7. Click on **SEND**.



8. You should now get a response displaying **200 OK**.
9. When you click on the little star next to the **SEND** button, you can save this URL for later use.

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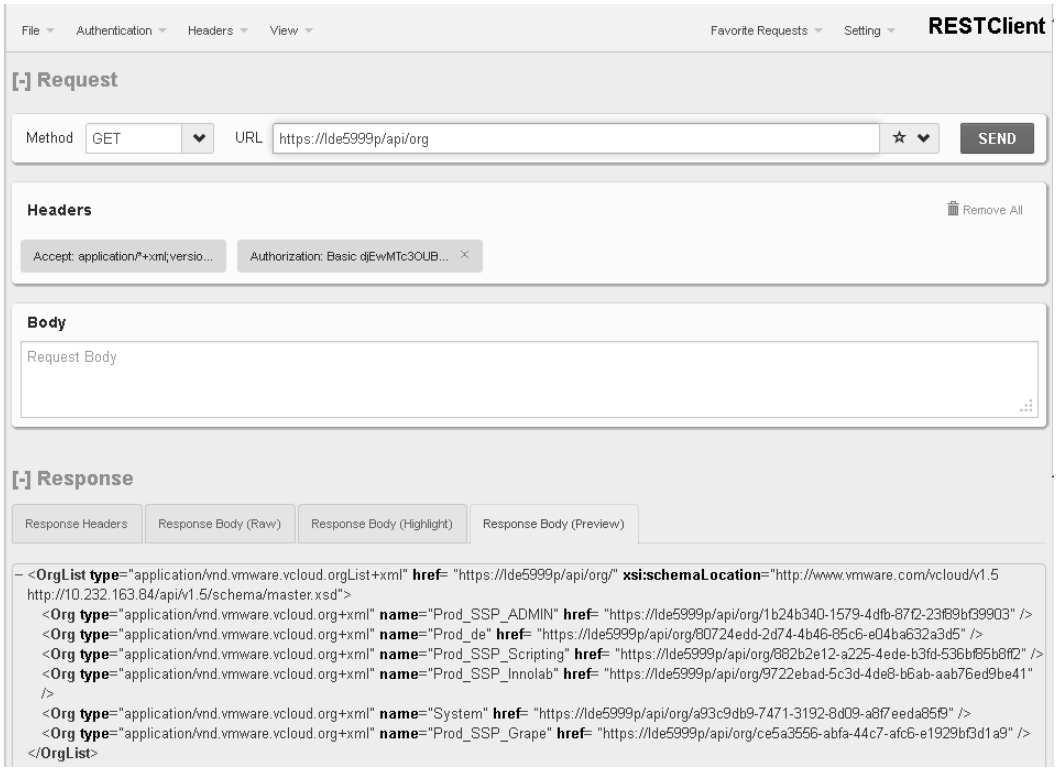
10. Click on the field **Response Body (Preview)** to see the child elements that exist. We will be using this view from now on as it gives us the links to follow.

Gathering information

Now that we are logged on, let's get the information we need to deploy a vApp by performing the following steps:

1. Set the **Method** to **GET** and **URL** to `.../api/org`.
2. Click on the Href for the organization we want to deploy in. It will now be put into the **URL** window above. Notice the long number? That's the unique reference for any object.
3. Click on **SEND** and you should now see in **Response** the OvDCs and Organization Networks that are part of the organization. Under each object, you will always see all its child objects.



4. Copy the Href for the OvDC you want to deploy the vApp in onto a Notepad. We need that link to create the new vApp.

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5. Copy the Href for the Organization Network you want to use with the vApp onto a Notepad.
6. If your vApp template is in the same organization as the one you want to deploy it in, you need to find the catalog item in the response. If not, go back to the start (`/api/org`) and click on the catalog where your vApp template is located.
7. Click on the blue Href link from the catalog and it will be automatically put into the URL, then just click on **SEND**. Work your way down to the object you want.
8. The Catalog contains the catalog items. Choose the one that contains your vApp template.
9. Copy the Href of the vApp template object onto a notepad.
10. Now, we just need to get the name of the network the vApp template was constructed with. Click on the Href for the vApp template and press **SEND**.
11. The response is a long XML message; you need to find `<NetworkConnection network=`.
12. Behind `network=` is the name of the network you created the template with; copy it to a Notepad. The name is rather important as vCloud just substitutes the original network the vApp deploys with the new one. Therefore, we need the old name and the new network reference.

Creating a new vApp

Now that we have collected all the information, let's create a new vApp. For that we need to build up the XML for the REST post.

1. Copy the Href of the OvDC into the URL and click on **SEND**.
2. Now set **Method** to **POST** and add `/action/instantiateVAppTemplate` at the end of the existing URL. It should now read like **https://myCloud/api/vdc/[href code]/action/instantiateVAppTemplate**.
3. Click on **Headers** and select **Custom Header**.
4. Enter `Content-Type` as the name and `application/vnd.vmware.vcloud.instantiateVAppTemplateParams+xml` as the value.
5. The header section should now contain three headers: **Authentication**, **Accept**, and **Content-Type**.
6. Now we need to add the following XML to the body. I have highlighted the lines that need to be changed.

```
<InstantiateVAppTemplateParams
  xmlns="http://www.vmware.com/vcloud/v1.5"
  name="[MyNewvApp]"
  deploy="true"
  powerOn="false"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```


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```
xmlns:ovf="http://schemas.dmtf.org/ovf/envelope/1">
<Description>[My New vApp]</Description>
<InstantiationParams>
<NetworkConfigSection>
       <ovf:Info>Configuration parameters for logical
         networks</ovf:Info>
       <NetworkConfig
          networkName="[Old vApp Template Network NAME]">
          <Configuration>
             <ParentNetwork
                href="[href of the OrgNe]" />
             <FenceMode>bridged</FenceMode>
          </Configuration>
       </NetworkConfig>
    </NetworkConfigSection>
  </InstantiationParams>
 <Source href="[href of the vApp Template]" />
  <AllEULAsAccepted>true</AllEULAsAccepted>
</InstantiateVAppTemplateParams>
```

7. When all the preceding code is put in, click on **SEND**.
8. If you did anything wrong, a long error message appears as the response; scroll to the very end to see what is wrong.
9. If everything is correct, the response you get back is a vApp. The new Href is in the `<VApp>` object. Copy the vApp Href onto a Notepad; we will need it to power it on.

Powering on

1. Set **Method** to **Post**.
2. Delete the content type from the header and the content from the body.
3. Copy the new vApp Href from the last step into the **URL** field and add `/power/action/powerOn` at the end. The URL should now look something like **https://myCloud/api/vApp/[href code]/power/action/powerOn**.
4. Alternatively, you could start with `/api/org` and click through to the vApp you created, and then look for power on. There is a Href with the action attached to it.
5. Click on **SEND**.

How it works...

It is clear that the example we saw on how to use the vCloud REST API is not really the best way to automate vCloud. What is shown here is how the REST API works and how objects are constructed. Every language that connects to the vCloud must use the API and the way it works. If you can do something in REST, you can use the same methods to recreate it in any of the languages. Have a look at the way PHP creates a new vApp; it is quite similar.

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As I mentioned before, the vCloud GUI doesn't use the REST interface. This means that you can't always follow the way the vCloud API does things. Create a new vApp via the GUI and you will see that you can define the VM name and the VM hostname, as well as the network IP. Using the REST API, you will need to perform all the previous steps in this recipe after the vApp is created.

See also

- *vCloud Director API Reference* at `http://pubs.vmware.com/vcd-51/index.jsp`. After the website opens, click on vCloud API Schema Reference
- vCloud API Community at `http://communities.vmware.com/community/vmtn/developer/forums/vcloudapi`

Accessing vCD via PHP

This is how you use PHP to work with vCloud.

Getting ready

Download the PHP vCloud API for vCloud from `http://www.vmware.com/go/vcloudsdkforphp`.

I assume you will use PHP on Linux, so you might need a Linux VM with PHP libraries and the PHP base configuration. You probably need the `HTTP_Request2` and `Net_URL2` libraries.

Untar the download into the directory from where you would like to use the files. Place the new script in the main directory (`vCloudPHP-5.1.2`). You can move them; however, that requires you to reconfigure the pointer to the libraries.

If you are playing on a Windows environment, the base install might be different and you will need to follow the instructions that come with the Windows installer.

How to do it...

In this section, we will create a program that will deploy a new VMs from a command line. We will put some variables inside the program and some to use via the command line. The script we are using is an adapted and simplified version of the base `hellovcloud.php` script that ships with the vCloud API in the sample folder.

Also, it might be interesting to compare the REST approach (see the previous recipe) to the PHP approach as they are rather similar.

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Base PHP skeleton

1. First we create the skeleton of the PHP script:

```
<?php
// add library to the include_path
set_include_path(implode(PATH_SEPARATOR, array('.','/library',
                         get_include_path(),)));

require_once 'VMware/VCloud/Helper.php';
require_once dirname(__FILE__) . '/config.php';
 [put script here]
?>
```

2. Then we need to define the input options from the command line. Put everything that follows from now on between `<?php ?>` tags.

```
// Define the input paramaters
$longs  = array(
    "vm:", //the vApp name
    "vdc:",  //the OvDC we are deploying to
    "onet::",  //the ONet we will be connecting the VM to.
);
$shorts  = "";
$opts = getopt($shorts, $longs);

// loop through command arguments
foreach (array_keys($opts) as $opt) switch ($opt)
{
   case "vm":
        $vAppName = $opts['vm'];
        break;
   case "vdc":
        $vdcName = $opts['vdc'];
        break;
   case "onet":
        $OrgNetName= $opts['onet'];
        break;
}
```

Because we don't want to define everything through the command line, we are making some variables static. If you wonder about the $TNet, the name of the vApp template network, have a quick look at the REST section, where it is explained.

```
//Connection variables
$server = "[vCloud Server]";
$user= '[username]@System';
```


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```
$pswd= '[Password]';

//initialize some other variables
  $vAppTempName = "[vapp template name]";
  $TNet="[name of the network the template was build with]";
  $vdcRef=null;
$vAppTemplateRef=null;
```

Connecting to vCloud

1. Let's connect to the vCloud.

```
$httpConfig = array('ssl_verify_peer'=>false,
   'ssl_verify_host'=>false);
$service = VMware_VCloud_SDK_Service::getService();
$service->login($server, array('username'=>$user,
   'password'=>$pswd), $httpConfig);
```

Gathering information

Now, let's gather all the information we still need to create a new vApp.

We need to get the object reference (called SDK Object) for the OvDC. I will explain all the steps as comments (//) in the following code:

```
//get ovDC ref
$OrgRefs=$service->getOrgRefs();
//get all Orgs from vCloud
foreach ($OrgRefs as $OrgRef) {
//loop thought all Orgs to find OvDC
  $sdkOrg = $service->createSDKObj($OrgRef);
//make Org SDK object out of Org Reference
  $vdcRefs = $sdkOrg->getVdcRefs($vdcName);
//get all the OvDCs in the Org that match the name $vdcName
  if (1 == count($vdcRefs))
  {
      $vdcRef=$vdcRefs[0];
//Found!
    break;
  }
}
if (!$vdcRefs){
//not found
    exit("No OvDC $vdcName found\n");
}
$sdkVdc = $service->createSDKObj($vdcRef);
//make a OvDC SDK object out of OvDC ref
```


For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

Now that we found the SDK Object of the OvDC, let's get the Organization Network.

```
//get ONet Ref
$netRefs = $sdkOrg->getOrgNetworkRefs($OrgNetName);
//as we know what we are looking for we can search directly for it
if (0 == count($netRefs))
{
    exit("Onet $OrgNetName not found\n");
}
$netRef = $netRefs[0];
$pnetwkRef = VMware_VCloud_SDK_Helper::createReferenceTypeObj(
                                          $netRef->get_href(),
'ParentNetwork');
//to connect the Network directly we need to get the parent network
reference.
```

Last but not least, we need the template `Ref`. We use the same method we used in the OvDC. We loop through all Orgs and all OvDCs to find the vApp template.

```
//get Template
$TOrgRefs=$service->getOrgRefs();
foreach ($TOrgRefs as $TOrgRef) {
  $TsdkOrg = $service->createSDKObj($TOrgRef);
  $TvdcRefs = $sdkOrg->getVdcRefs();
  foreach ($TvdcRefs as $TvdcRef) {
    $TsdkVdc = $service->createSDKObj($TvdcRef);
    $vAppTemplateRefs = $TsdkVdc-
  >getVAppTemplateRefs($vAppTempName);
    if ($vAppTemplateRefs)
    {
          $vAppTemplateRef = $vAppTemplateRefs[0];
      break 2;
    }
  }
}
if (!$vAppTemplateRef){
    exit("No vAppTemplate with name $vAppTempName is found\n");
}
```

Creating a new vApp

Now it is time to create a new vApp. I would recommend having a look at the REST section and to spot the similarities.

```
$info = new VMware_VCloud_API_OVF_Msg_Type();
$info->set_valueOf("Configuration parameters for logical
  networks");
```


For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

```
$conf = new VMware_VCloud_API_NetworkConfigurationType();
$conf->setParentNetwork($pnetwkRef);
$conf->setFenceMode('bridged');

$netconf = new VMware_VCloud_API_VAppNetworkConfigurationType();
$netconf->set_networkName($TNet);
$netconf->setConfiguration($conf);

$section = new VMware_VCloud_API_NetworkConfigSectionType();
$section->setInfo($info);
$section->setNetworkConfig(array($netconf));

$iparams = new VMware_VCloud_API_InstantiationParamsType();
$iparams->setSection(array($section));

$params = new
  VMware_VCloud_API_InstantiateVAppTemplateParamsType();
$params->set_name($vAppName);
$params->setDescription("Something");
$params->setInstantiationParams($iparams);
$params->setSource($vAppTemplateRef);

$vApp=$sdkVdc->instantiateVAppTemplate($params);
```

Powering on the vApp

After we instantiated the vApp, we need to find it and then power it on. Between the instantiate command and the `powerOn` command, there should be enough time for vCloud to finish creating the new vApp; we will wait until the task of instantiating has finished.

```
$tasks = $vApp->getTasks()->getTask();
    if ($tasks)
    {
        $task = $tasks[0];
        $service->waitForTask($task);
    }
```

Now we need to get the SDK object of the new vApp.

```
$vAppRefs = $sdkVdc->getVAppRefs($vAppName);
$vAppRef = $vAppRefs[0];
$sdkVApp = $service->createSDKObj($vAppRef);
```


For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

Now we just need to power the vApp on.

```
$params = new VMware_VCloud_API_DeployVAppParamsType();
$params->set_powerOn(true);
$params->set_deploymentLeaseSeconds(null);

$sdkVApp->deploy($params);
```

How it works...

PHP is one of the easy ways to get vCloud automation going from Linux; however, it works just as well in Windows. The main reason for using PHP is that you could put the program directly into a web server and create your own little web server that provisions VMs automatically.

See also

- The help files come with the download, go to the directory `[download location]/vcloudPHP-5.1.2/docs/`
- PHP Language reference at `Php.net`
- VMware PHP vCloud community at `http://communities.vmware.com/community/vmtn/developer/forums/vcloudsdkphp`

Using vCenter Orchestrator to automate vCloud

We now look into automation using vCenter Orchestrator (vCO).

Getting ready

You need to download the vCO appliance (version 5.1 or better) from VMware. vCO is part of the normal vSphere software bundle. The appliance is preconfigured with an internal DB and LDAP and makes getting started with vCO easier. If you are already using vCO as a Windows install, that's fine.

After downloading, installing, and configuring vCO, we are ready to go. If you need some help with configuring, refer the *See also* section of this recipe.

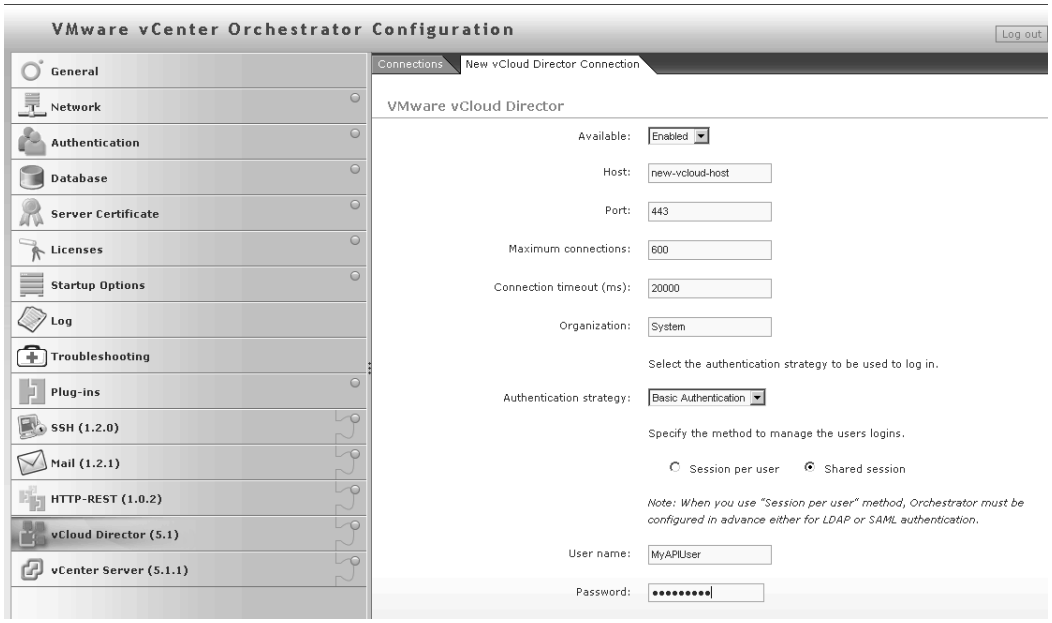
For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

How to do it...

The first connection

First we need to connect the downloaded vCO to our vCloud by performing the following steps:

1. Open a web browser and go to `https://[vCO URL]`.
2. Click on **Orchestrator Configuration**.
3. Log in to the configurator.
4. Click on **Network** and then on **SSL Trust Manager**.
5. Enter the URL of your vCloud Director in **Import from URL** and then click on **Import**. This will add the SSL cert of your vCloud Director to the vCO-accepted SSL certs.
6. Now click on **vCloud Director (5.1)**.
7. Click on **New vCloud Director Connection**.



8. Fill out the form:
    1. Enter the URL for your vCloud into **Host**.
    2. Put `System` (capital S) into **Organization**.
    3. Choose **Basic Authentication** in **Authentication strategy**.
    4. Check **Shared session**.
    5. Enter your API users' credentials.

For More Information:
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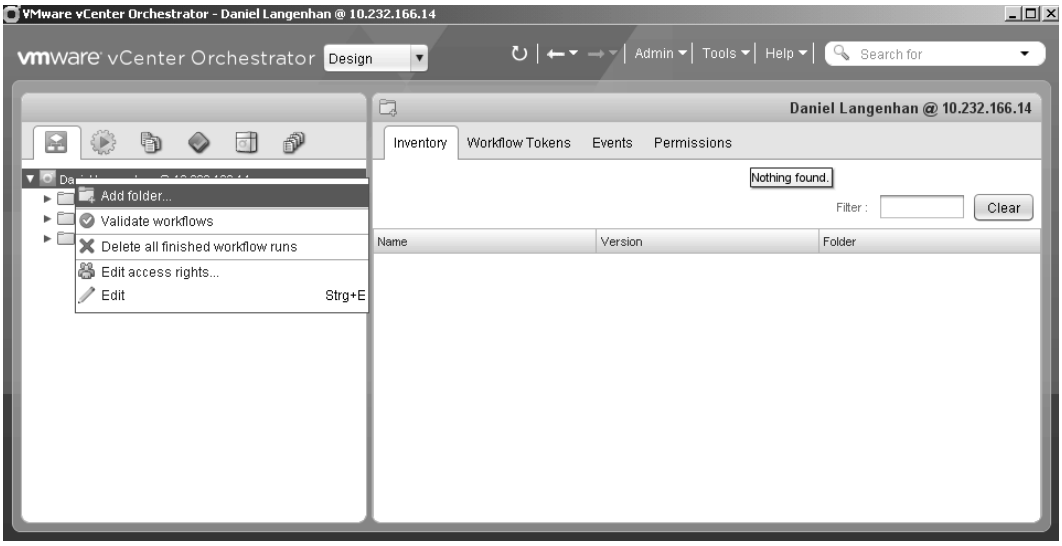
9. Click on **Apply changes**.
10. You should now have a new entry in the vCloud Director settings and vCO should now be ready to connect to this vCloud.

Gathering information

We will depart from the pattern we have established as vCO doesn't work that way. Instead, we will have a quick look at how vCO works.

We will now create a new workflow that will create a new vApp and power it on. This is a longer recipe, but it will teach you a lot.

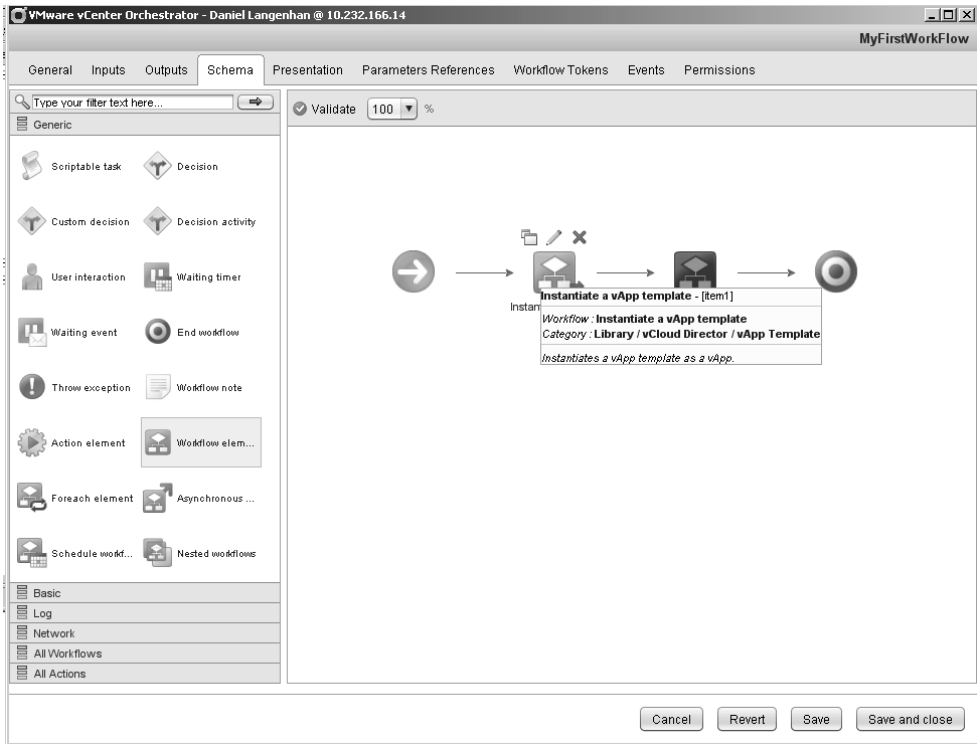
1. Log in to vCO:
    1. Open a web browser and go to `https://[vCO URL]`.
    2. Click on **Start Orchestrator Client**.
    3. Log in to vCO.
    4. On the top is the drop-down menu; enter it and select **Designer**.
2. Create a new workflow:
    1. Right-click on your user name and select **New Folder**. Give it a name (for example, `MyStuff`) and click on **OK**.



    2. Right-click on the folder and select **New workflow**.
    3. Give it a name (for example, `MyFistWorkFlow`).
    4. You now see the editor window of the workflow.

For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

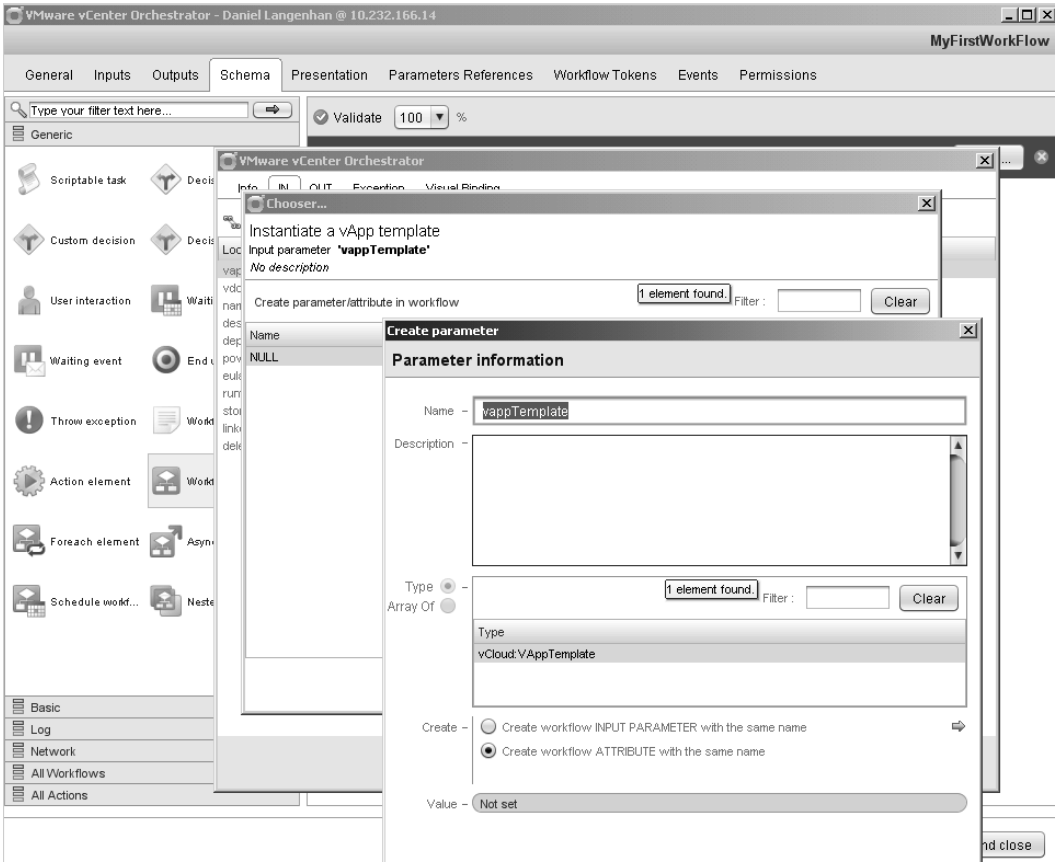
3. Add elements to the workflow:
    1. Click on **Schema**.
    2. Select **Workflow element** from the **Generic** elements and drag it between the green arrow (at the start of the workflow) and the grey circle (at the end of the workflow). A window will appear; enter into the search text `Instantiate`. As you type, you will see that you get fewer choices. Select the **Instantiate a vApp Template** workflow and click on **Select**.
    3. Choose the workflow element again and drag it between the instantiate and end markers.
    4. Select the **Power on a vApp** workflow.



4. Deal with the `IN` and `OUT` attributes of workflows:
    1. Now, we need to define the variables (in vCO language attributes). Move your mouse over the **Instantiate** workflow and then click on the pencil icon that appears.
    2. In the window that opens, click on **IN**. Here are all the attributes that the Instantiate workflow needs in order to work. We will now go and define them.

For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

3. Each attribute has **Not set** in the column **Source Parameter**. Click on the first **Not set**; another window opens.
4. Click on **Create parameter/attribute in workflow**.
5. In the next window that appears, just click on **OK**. It will create this attribute with the default name in our workflow.



6. Repeat the process with all the inputs.
7. Now move on to the **OUT** section. There is only one attribute, `vappOut`; repeat the above process.
8. Click on **Close**.
9. Now move on to the **Power On** workflow. In the **IN** section, there is only one variable called **vApp** and you will see that it is now already automatically mapped to **vappOut**. **vappOut** is the reference of the new vApp we will create with the Instantiate workflow. You can click on **Close** as this element has already been configured by vCO.

For More Information:
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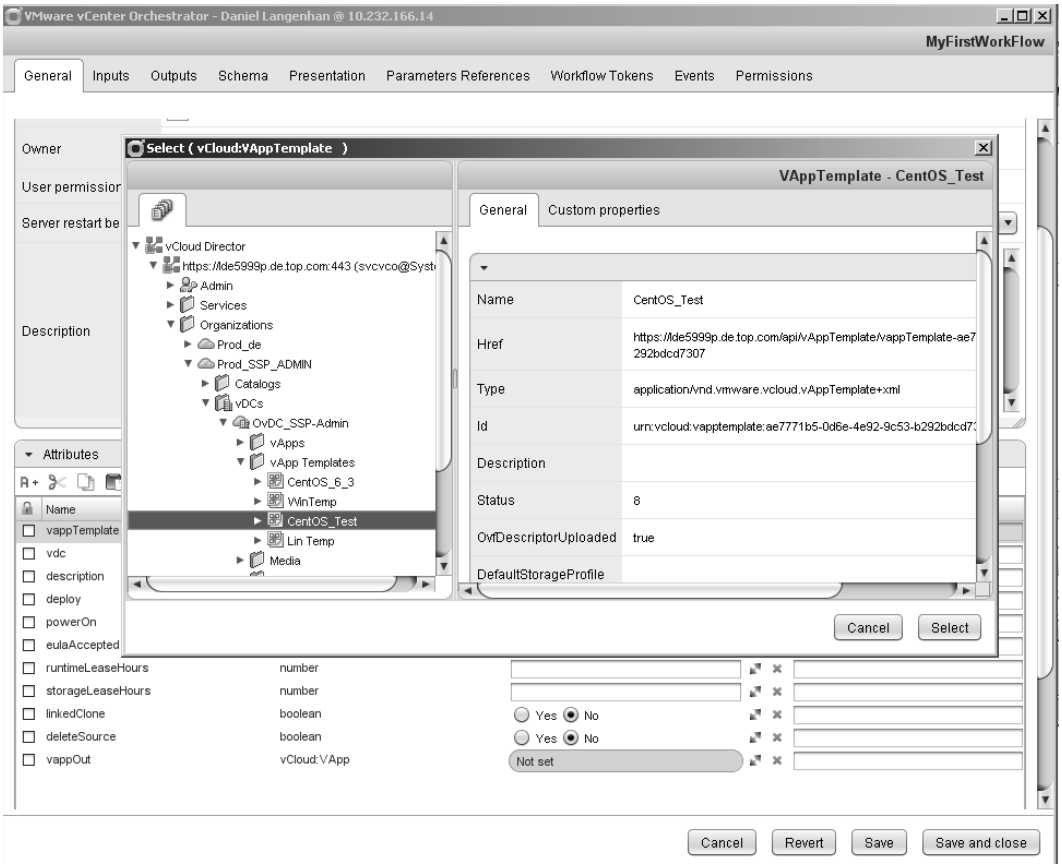
5. General, input, and output attributes:
    1. Click on **General**. You will find that all the variables you created are collected here. We will now configure some static variables and move the others to the **Inputs** section. Attributes in the **Inputs** section will prompt the user for an input. Attributes in the **General** section are static.
    2. We will ask the user for the name of the new vApp. Move it to the **Inputs** section by right-clicking on the **Name** attribute and selecting **move as the INPUT** parameter.
    3. We will select a static template, meaning we will not ask the user for it. But we still have to define what we put into it, so click on **Not set** next to the attribute.
    4. A new window will open showing you the content of your vCloud. Navigate to the vApp template you want to use to deploy and click on **Select**.



5. Continue to choose what input you will ask the user for and what you define yourself static.

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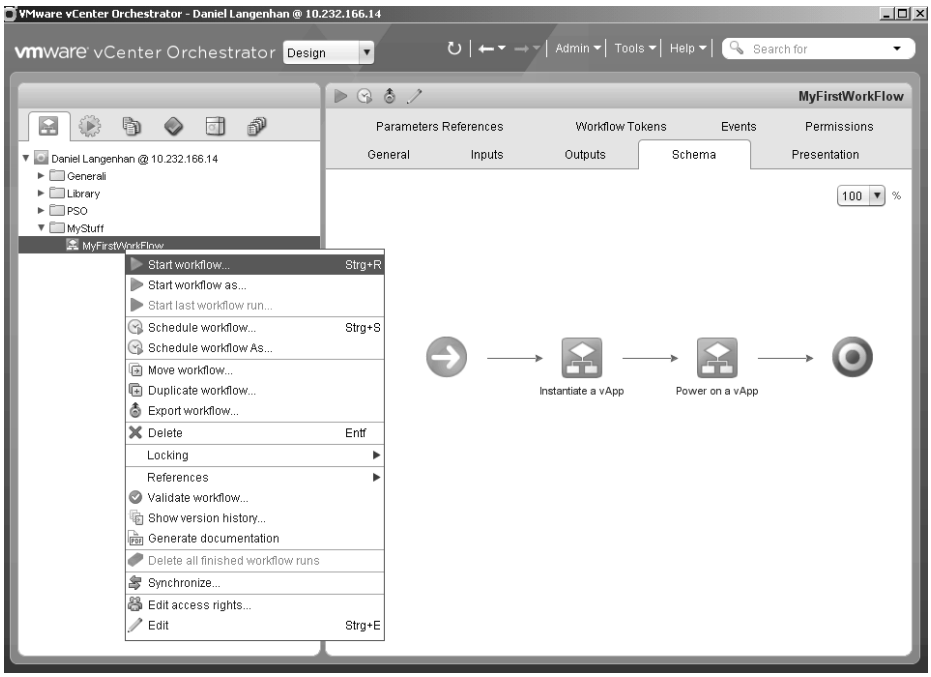
6. Verify the workflow:
    1. Click on **Save and Close**.
    2. A window will pop up telling you that the workflow isn't validated. That's expected at this stage and I wanted to show this to you. Click on **See details**.
    3. The validation will show you that the **vAppOut** attribute of the **Power On** workflow element has not been set properly. Click on **Bind Attribute** and then select **vAppOut**.
    4. Select the **vappOut** attribute and bind it to the output.
    5. Click on **OK**.
    6. Click again on **Save and Close**.
7. Version control:
    1. Now a window will appear asking you if you would like to increase the version number; do so.
    2. You are back in the workflow folder. You can now explore your workflow without editing. Go explore a bit.

Creating a new vApp and powering it on

Now that we created a complete new workflow, let's run it.

1. Right-click on the workflow we created and select **Start Workflow...**.



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2. vCO will now pop up a window that asks you for your input. Answer all the questions.
3. Watch the workflow execute; see how it goes into subworkflows and starts filling up the log.
4. After the workflow has run, you will see that it keeps the runs stored under the workflow. You can go back into the run and have a look at the attributes and logs.

How it works...

vCenter Orchestrator is quite a powerful tool to use. It can not only interact with vCloud but also with vCenter. In addition to that, you can download and install plugins that allow you to use SSH, PowerShell, REST, or SQL to communicate with other systems.

Each of the plugins need to be installed via the vCO configuration tool, but can then also be accessed via vCO. Each of the plugins bring pre-created example workflows as well as a lot of small useful scripts (called Actions in vCO).

There's more...

vCenter Orchestrator not only lets you build workflows but also allows you to create webviews. Webviews are small web pages where workflows are displayed and can be started from. This allows for automation using a web browser. You should have a look at it as it is rather cool.

Last but not least, you can call vCO workflows via HTTPS, start them, check on their status, and get the result. This makes it very easy to add vCO as the domain-scripting solution for all things VMware. Remember that you can script vCenter via vCO directly and vShield via the REST plugin for vCO.

Not only can vCO use HTTPS but also it can use AMPQ, which allows for a more modern approach on the subject of automating a whole VMware, Windows, Linux, Storage, and Network environment.

See also

- VMware vCenter Orchestrator at `http://www.vmware.com/support/pubs/orchestrator_pubs.html`
- A brief document on how to get vCO working at `http://communities.vmware.com/docs/DOC-20368`
- If you would like to learn more about vCO, I recommend the book *Automating vSphere with VMware vCenter Orchestrator* by *Cody Bunch*, *VMware Press Technology*

For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

A scripted cell shutdown

We will now create a more controlled shutdown of vCloud.

Getting ready

This script that you create will be running on the vCloud Director VM itself, so we need to be able to log in to the VM and become a root user.

You also need a user account, that is `SysAdmin` in order to execute the script.

How to do it...

There are two ways to get the script into the vCloud VM:

- Copy/paste via SSH:
    1. Log in to the vCloud Director VM via a SSH Client (for example, Putty).
    2. Gain root access, if you haven't already.
    3. Type the command `vi /sbin/vCloud-Shutdown`.
    4. The text editor vi opens. Press the *i* key.
    5. Copy and paste the code into vi.
    6. Press the keys *w* and *q* to save and quit vi.
    7. Run the command `chmod 744 /sbin/vCloud-Shutdown`.
- Copy via SCP or SFTP:
    1. Open up a connection to the vCloud Director VM with an SCP (WinSCP).
    2. Copy the program to `/sbin/`.
    3. Close the connection.
    4. Log in to the vCloud Director VM via an SSH Client (for example, Putty).
    5. Gain root access, if you haven't already.
    6. Run the command `chmod 744 /sbin/vCloud-Shutdown`.

The script

The script is given as follows:

```
#!/bin/bash

VCLOUD_HOME=/opt/vmware/vcloud-director/bin
VCDUSER="vcdadmin"
```


For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

```
VCDPASS="mypassword"
#
# check if cell is running
#
STATUS=$($VCLOUD_HOME/cell-management-tool -u $VCDUSER -p $VCDPASS
  cell -status 2>&1 |  grep -i "is active = ")
echo "STATUS :: $STATUS"

case $STATUS in
  *true)
    $VCLOUD_HOME/cell-management-tool -u $VCDUSER -p $VCDPASS cell
  -quiesce true

    while [[ true ]];do
      ACTIVE=$( $VCLOUD_HOME/cell-management-tool -u $VCDUSER -p
  $VCDPASS cell -status | sed -n 's/Job count = \([0-9]*\)/\1/p')
      if [[ ACTIVE -eq 0 ]];then
                    break
            fi
            sleep 60
    done
    RESULT=$($VCLOUD_HOME/cell-management-tool -u $VCDUSER -p
  $VCDPASS cell -shutdown)

    service vmware-vcd status

    while [[ true ]];do
             count=$(service vmware-vcd status | grep "is not
               running" | wc -l)
            if [[ $count -eq 2 ]];then
                    break
            fi
            sleep 10
      echo -n .
      RESULT=$($VCLOUD_HOME/cell-management-tool -u $VCDUSER -p
        $VCDPASS cell -shutdown)
    done
    echo $(service vmware-vcd status)
    ;;
  *false)
    ACTIVE=$( $VCLOUD_HOME/cell-management-tool -u $VCDUSER -p
      $VCDPASS cell -status | sed -n 's/Job count = \([0-
      9]*\)/\1/p')
    if [[ ACTIVE -ne 0 ]];then
      echo "JOBS active ($ACTIVE), wait ..."
```


For More Information:
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```
        $VCLOUD_HOME/cell-management-tool -u $VCDUSER -p $VCDPASS
          cell -quiesce true

        while [[ true ]];do
          ACTIVE=$( $VCLOUD_HOME/cell-management-tool -u $VCDUSER -p
            $VCDPASS cell -status | sed -n 's/Job count = \([0-9]*\)/\1/
p')
          if [[ ACTIVE -eq 0 ]];then
                         break
                fi
                sleep 30
          echo -n .
        done
        RESULT=$($VCLOUD_HOME/cell-management-tool -u $VCDUSER -p
          $VCDPASS cell -shutdown)

        service vmware-vcd status

        while [[ true ]];do
                   count=$(service vmware-vcd status | grep "is not
                     running" | wc -l)
                  if [[ $count -eq 2 ]];then
                          break
                  fi
                  sleep 10
        echo -n .
        RESULT=$($VCLOUD_HOME/cell-management-tool -u $VCDUSER -p
          $VCDPASS cell -shutdown)
        done
        echo $(service vmware-vcd status)
      fi
      ;;
    *)
      echo "Status :: $STATUS :: don't know what to do"
      ;;
esac
```

How it works...

Let's see why we have built the preceding program in the first place. We can shut down the vCD VM using vCenter, by using the command `service vmware-vcd stop`.

Using the `service` command to shutdown vCD has a disadvantage: it just stops vCD regardless of operations that are currently under way. In the user manual of vCloud, the proper shutdown of a vCloud cell is shown using the `cell-management-tool` tool.

For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

The `cell-management-tool` tool is found in the `/opt/vmware/vcloud-director/bin/` directory. You require a vCD `SysAdmin` account to operate it. To shut down vCD properly, you first have to quiesce the cell by using the command `cell-management-tool -u VCLOUDUSER -p VCLOUDPASS cell -quiesce true`.

Where VCLOUDUSER is your vCD `SysAdmin` account, just the account no `@System` is required and `VCLOUDPASS` is the corresponding password. After you quiesce the cell, you should check if any jobs are still running by using the command `cell-management-tool [user and pass] cell –status`.

When the Job Count reaches zero, you can shut down the cell by running the command `cell-management-tool [user and pass] cell –shutdown`.

Now, you can check the status of the vCD cell with the command `service vmware-vcd status`.

After the cell is shut down, you can do the maintenance of the VM or shut down the VM.

Starting vCD is always via the command `service vmware-vcd start`.

However, if you have just updated vCD or recovered from an error, it is advised to monitor the messages log; the best command for that is `Tail –f /opt/vmware/vcloud-director/log/vcloud-container-debug.log`.

For more information refer to *Chapter 8*, *Troubleshooting vCloud.*

There's more...

Another slightly annoying problem with scripts is that they contain the `SysAdmin` password of vCD in clear text. There are a lot of ways around that; here is one of the easiest while not the most secure:

1. Create a text file with the vCloud `SysAdmin` password in clear text. Save it in the `/opt/vmware/vcloud-director` directory. Give it permissions that only root can read (700 root:root); you can also hide it by using `.` at the beginning of the filename.
2. Then add the following lines at the beginning of the preceding script:

```
PWFILE=/opt/vmware/vcloud-director/.pwfile
if [[ ! -f $PWFILE ]];then
        echo "No pwfile found"
        exit
fi
```

3. Now, replace every occurrence of `-p $VCLOUDPASS` with `-p 'cat $PWFILE'`.

For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

Adding ISO files to vCD automatically

Here is a good programming idea that you can now create. It's not easy, but a neat challenge and a very useful little program to have a go at.

Getting ready

Choose a language or tool of your choice. If you don't have a preferred one, think about which system will interact with the program or which platform you will be running the script under.

How to do it...

First, we need to define what the program should do:

- We want to upload a .iso file from the local disk of your desktop
- We want to add the .iso file to a catalog in vCloud

Here are the programming steps you need to do:

1. Create an object that contains the media filename and location as well as the type ISO.
2. Get the OvDC reference where the catalog we want to upload is stored.
3. Get the catalog reference.
4. Upload the media to the catalog.
5. Wait for the task to finish.

How it works...

To learn a programming language and an API is hard. The first reference you should consult is the API reference of vCloud. I normally start with the REST API as it shows me what is possible, whereas the specific language references show me only what has been implemented as methods so far.

I found people who posted programs that uploaded media in Powershell and PHP. Doing it in vCO isn't that difficult because there is already a workflow you can use as a base.

Why do I think this is a useful little program? Think about a loop you could put in there and upload all the ISOs into one library; then go home while everything is being automated.

For More Information:
www.packtpub.com/vmware-vcloud-director-cookbook/book

Where to buy this book

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